

Caudal deeply forked, the longest rays being twice as long as the shortest.

Colour greenish brown above, sides and lower parts silvery. A few scattered dark spots on upper half of body.

One specimen (ca. 500 mm.) from the Indus near Leh.

L.—*The Species of Three-spined Sticklebacks*
(*Gastosteus*). By C. TATE REGAN, M.A.

I HAVE recently made a study of the Three-spined Sticklebacks (*Gastosteus*) in the British Museum, with a view to determining the number of species which may be recognized. After examination of a large number of specimens, representing all the nominal species which have been described, I have arrived at the conclusion that the greater part of the area of the genus is occupied by a single species, *G. aculeatus*, which is very variable. In the northern part of its range in the sea the dermal ossification is strong, the series of bony plates complete, the caudal keel prominent, the ectocoracoids long and the naked areas above them consequently large, the pelvic plate long, lanceolate, without an anterior notch, and the fin-spines usually either long or strong. Towards the southern part of its range in the sea, or in fresh water, the dermal ossification is weaker; if the bony plates form a complete series they are not so deep nor usually so numerous as in northern marine examples, and the caudal keel is less prominent; the series of plates may be incomplete, the first to disappear being the ones preceding the caudal keel, the most persistent being the three (5th to 7th) which are usually in contact with the ascending process of the pelvis; sometimes the plates are entirely absent. The pelvic plate becomes shorter and may develop an anterior notch, becoming heart-shaped, arrow-shaped, or even V-shaped; also the naked area in front of the pectoral fin may become smaller, the spines shorter or weaker, and the fin-rays more or less reduced in number.

I am unable to detect any difference between specimens from the Atlantic and Pacific: for example, fully-mailed specimens from Puget Sound appear to me to be in every way identical with some from the Shetlands; similarly, specimens from the Santa Clara River, California, agree closely with others from various inland localities in the British Isles, from Northern Italy, and from Japan.

Gastrosteus aculeatus is found on the coasts and in the rivers of Northern Europe, Asia, and America, extending southwards to the Iberian Peninsula, Northern Italy, the Black Sea, the Santa Clara River in California, and New Jersey. In the northern part of its range it is principally marine, but further south seems to take less and less to the sea; finally, in Southern Italy, in Algeria, and in streams south of the Santa Clara River in California it is represented by three distinct permanently fluviatile species, which can only owe their differentiation to the fact that they are not now, and have not for some time been reinforced from the ranks of the marine sticklebacks.

As synonyms of *G. aculeatus* I include all the species hitherto described, with the exception of *G. algeriensis*, Sauv.

Gastrosteus aculeatus has III (II-V) 9-14 dorsal rays, 17-11 anal rays, and 31 to 33 vertebræ. The snout is shorter than the postorbital part of the head, and the first dorsal spine is inserted nearly above the base of the pectoral fin and well in advance of the pelvic spine. The three species which I recognize as distinct from it are:—

1. *Gastrosteus hologymnus*, sp. n.

Gastrosteus argyropomus (non Cuv. & Val.), Günth. Cat. Fish. i. p. 4 (1859).

Depth of body 4 in the length, length of head 3 to $3\frac{1}{2}$ (♂) or $3\frac{2}{3}$ (♀). Snout longer than eye, as long as or only a little shorter than the postorbital part of head; diameter of eye 4 in the length of head, interorbital width $4\frac{2}{3}$ to 5. Sides of body without bony plates; naked area in front of pectoral rather small; pelvic plate notched in front, twice as long as broad, $\frac{1}{2}$ to $\frac{2}{3}$ the length of head. Dorsal with 12 or 13 soft rays, anal with 8 to 10; origin of first dorsal spine a little behind the base of the pectoral; second spine $\frac{1}{4}$ the length of head; pectoral extending beyond the vertical from second dorsal spine; pelvic spines $\frac{1}{3}$ to $\frac{2}{3}$ the length of head. 31 or 32 vertebræ.

Hab. Rome.

Five specimens, 55 to 60 mm. in total length.

The complete absence of bony plates distinguishes this form from the *gymnurus* variety of *aculeatus* found in Northern Italy, whilst the produced snout gives it quite a different physiognomy. Were it not for this last character I should not regard this form as specifically distinct, as a percentage of naked specimens occurs among the sticklebacks of Santa Clara River in California.

2. *Gastrosteus algeriensis*.

Gastrosteus algeriensis, Sauvage, N. Arch. Mus. Paris, x. 1874, p. 17.

Depth of body $3\frac{1}{4}$ to $4\frac{1}{3}$ in the length, length of head 3 to $3\frac{2}{3}$. Snout as long as or a little shorter than eye, the diameter of which is 3 to $3\frac{1}{2}$ in the length of head; interorbital width 4 to $4\frac{1}{2}$ in the length of head. Usually 2 or 3 bony plates above the ascending process of the pelvis; naked area in front of pectoral small; pelvic plate usually notched in front, its breadth $1\frac{1}{3}$ to $2\frac{1}{4}$ in its length, which is $\frac{2}{3}$ to $\frac{3}{4}$ of the length of head. Dorsal with 11 or 12 soft rays, anal with 8 to 10; origin of first dorsal spine equidistant from the vertical through the bases of the pectoral and pelvic fins; second spine $\frac{1}{6}$ to $\frac{1}{4}$ the length of head; pectoral extending to or a little beyond the vertical from the second dorsal spine; pelvic spines $\frac{1}{4}$ to $\frac{1}{3}$ the length of head. 29 vertebræ.

Hab. Algiers.

Thirteen specimens, 38 to 55 mm. in total length, and a number of smaller ones not included in the description.

I am indebted to Dr. Günther for calling my attention to the reduced number of vertebræ in this form; I count the same number in two specimens.

3. *Gastrosteus santæ-annæ*, sp. n.

Gasterosteus williamsoni (non Girard), Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 750.

Depth of body $3\frac{1}{3}$ to 4 in the length, length of head $3\frac{1}{3}$. Snout as long as eye, the diameter of which is $3\frac{1}{3}$ to $3\frac{1}{2}$ in the length of head; interorbital width 5 in the length of head. Sides of body without bony plates (rarely with 2 or 3 anteriorly); naked area in front of pectoral very small; pelvic plate notched in front, $1\frac{1}{3}$ to $1\frac{3}{4}$ as long as broad, its length $\frac{2}{3}$ the length of head. Dorsal with 10 or 11 soft rays, anal with 6 or 7 (8); origin of first dorsal spine well behind the base of pectoral and only slightly in advance of the base of the pelvis; second spine $\frac{1}{5}$ to $\frac{1}{4}$ the length of head; pectoral extending to or nearly to the vertical from second dorsal spine; pelvic spines from $\frac{1}{4}$ to more than $\frac{1}{3}$ the length of head. 29 vertebræ.

Hab. Santa Anna River, California.

Three specimens, 38 to 45 mm. in total length, from Colton.

I am indebted to Dr. Jordan for a series of examples of the true *G. williamsoni* from Santa Clara River. In three of these I count 31, 31, and 32 vertebræ, and in all of them the insertion of the dorsal spine is only slightly behind the base of the pectoral.